

A Radiological Study of Anatomical Variations of Uncinate Process

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ABSTRACT

Aim: (a) To study the variations in the superior attachment of uncinat process. (b) Incidence of pneumatization of uncinat process was also studied.

Materials and methods: A total 200 sides of 100 CT scans of paranasal sinuses coronal section were studied for variations in the superior insertion of uncinat process using Landsberg and Friedman classification. Incidence of pneumatization of uncinat process was also studied.

Results: In our study out of 200 sides, type 6 attachment was commonest (41%) followed by types 1 and 2. Pneumatization of the uncinat was seen in very small percentage of cases.

Conclusion: Lateral insertion of uncinat (lamina papyracea + aggar nassi) is the commonest variant followed by the insertion into the skullbase. Pneumatization of uncinat is rare.

Clinical significance: Though the inferior attachment of the uncinat is almost constant the superior attachment has several variations, the knowledge of which is very important for the endoscopic surgeon to avoid intraoperative complications.

Keywords: Aggar nasi, Cribriform plate, Lamina papyracea, Middle turbinate, Pneumatization, Uncinat process.

How to cite this article: Patla SDK, Rathnakar P, Bhat VS, Jayaramesh. A Radiological Study of Anatomical Variations of Uncinat Process. *Clin Rhinol An Int J* 2016;9(2):59-61.

Source of support: Nil

Conflict of interest: None

INTRODUCTION

Osteomeatal unit is the key area in lateral wall of the nasal cavity, and uncinat process is one of the components of osteomeatal unit. It is a thin, almost sagittally oriented bony leaflet that runs from an anterosuperior position posteroinferiorly. The uppermost segment of the uncinat

process is no longer visible behind the insertion of middle turbinate resulting in a blind spot for surgeons during endoscopic sinus surgery. This uppermost portion can extend to the base of the skull, or it may turn laterally and insert into the lamina papyracea, or may turn frontally and fuse with the middle turbinate.¹ Uncinat process is a key landmark during functional endoscopic sinus surgery and is the first structure removed.² Preoperative detection of anatomic variations of the uncinat in the CT scan of paranasal sinuses (PNS) helps avoid intraoperative damage to the nasolacrimal duct, medial orbital wall, sphenopalatine artery, and anterior skull base, and therefore it is important surgically.^{3,4} This study was conducted at the Department of ENT, KS Hegde Medical Academy, Manglore, India, with the aim of determining the prevalence of variations in the superior attachment of the uncinat process and pneumatization of the uncinat process.

MATERIALS AND METHODS

Hundred consecutive CT scans of nose and coronal section done at the hospital were studied. The CT scan images of 3 mm thickness were taken using GE Bright Speed 16 slice scanner. All the images were analyzed using Radiant DICOM viewer. The CT scans of patients with previous history of endoscopic sinus surgery and with tumors of nose and PNS were excluded from the study. The variations in the superior attachment of uncinat process was noted and classified according to Landsberg and Friedman classification.⁵ Pneumatization of the uncinat process was also noted down.

RESULTS

The study included 61 males and 39 females, with mean age of 34.5 years (15–65 years). Two-hundred sides (n) of 100 CT scans of PNS were analyzed according to the Landsberg and Friedman classification system. In our study, out of 200 sides, type 6 attachment was commonest (41%) followed by type 1 (34.5%), type 2 (16.5%), and type 5 (7%). Types 3 and 4 were seen in only in 0.5% of the cases each (Table 1).

Pneumatization of the uncinat process was found in 8 of the 200 uncinat processes studied (4%), 7 of which were on the left side and 1 on the right side.

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Table 1: Classification of superior attachment of the uncinat process (n=200)

Side (n)	Type 1	Type 2	Type 3	Type 4	Type 5	Type 6
Right	39 (19.5%)	16 (8%)	0	0	6 (3%)	39 (19.5%)
Left	30 (15%)	17 (8.5%)	1 (0.5%)	1 (0.5%)	8 (4%)	43 (21.5%)
Total	69 (34.5%)	33 (16.5%)	1 (0.5%)	1 (0.5%)	14 (7%)	82 (41%)

DISCUSSION

Uncinate process is the most important and constant landmark in the osteomeatal complex of middle meatus of the nasal cavity, which is the key area for functional endoscopic sinus surgery. Landsberg and Friedman, classified the superior attachment of uncinat process as follows⁵:

Type 1: Insertion into the lamina papyracea (LP).

Type 2: Insertion into the posterior wall of agger nasi cell (ANC).

Type 3: Insertion into the lamina papyracea and junction of the middle turbinate with the cribriform plate (MTCP).

Type 4: Insertion in to junction of the middle turbinate with the cribriform plate.

Type 5: Insertion into the ethmoid skull base (ESB).

Type 6: Insertion into the middle turbinate (MT).

In this study, we aimed to study the variations of superior attachments of uncinat process according to the classification by Landsberg and Friedman. In the present study of 200 sides, 82 (41%) uncinates had type 6 attachments, 69 (34.5%) had type 1, 33 (16.5%) had type 2, 14 (7%) had type 5 attachments, and 0.5% cases showed types 3 and 4 attachments each.

Turgut et al⁶ reported types 1 and 2 uncinat process attachment to be 63%, type 3 to be 3%, type 4 to be 12%, type 5 to be 14%, and type 6 to be 8%. In a study conducted by Tuli et al⁷ and Min et al,⁸ lateral attachment of uncinat process (type 1) was most common, that is, 79.8 and 54% respectively, followed by attachment to skull base (type 5), that is, 16.67 and 24.5% respectively. In our study type 6 (insertion to middle turbinate) was found to be the commonest. This could be because we have subclassified lateral attachments of uncinat process (types 1 and 2). Krzeski et al⁹ reported type 5 to be commonest (33.12%), followed by type 1 (17.83). Study by Kumar et al¹⁰ reported type 2 to be the commonest (36%) followed by type 6 (20%) and type 1 (19%).

Most of the studies, including our study, show types 1 and 6 are the commonest variations of uncinat insertion followed by type 5 except for one study which shows type 5 is the commonest variation. Types 3 and 4 are found to be very rare.

Superior insertion type of the uncinat process may also affect the drainage pattern of the sinuses. When the uncinat process inserts into the lamina papyracea, maxillary sinus drainage may be affected. If insertion is made into the middle turbinate, a mechanism of sinus

mucus recirculation appears, which may also affect drainage of the maxillary or frontal sinus.^{11,12}

Pneumatization of Uncinat Process

Hyperneumatization of agger nasi cells posterosuperiorly results in development of pneumatized uncinat process which may cause narrowing of the hiatus semilunaris and the ethmoid infundibulum. It could also act as a predisposing factor for impaired ventilation of the anterior group of sinuses and frontal sinus.¹³

Pneumatization of the uncinat process, with a reported prevalence of 0.4 to 13% is a rare variation. When present, it may occupy the infundibular free regions resulting in areas of mucosal thickening.¹³

In the present study the uncinat process was pneumatized in 8 of the 200 sides (3.5%), 6 of which were left sided and one of them was bilateral. None of them showed any mucosal changes.

In a study by Bolger et al,¹⁴ uncinat pneumatization was found to be 2.5% in 202 patients which is consistent with our result. Arslan et al¹⁵ reported uncinat pneumatization in 4% of 200 patients. In one of the studies by Earwaker¹¹, involving a large study group of 800 patients, 9.1% had uncinat pneumatization.

Kumar et al¹⁰ found uncinat pneumatization in 3.41% of cases, left forms being predominant are consistent with our study.

CONCLUSION

Uncinat process can have different types of attachment superiorly. Though most of the studies show lateral insertion of uncinat (lamina papyracea + agger nassi) is the commonest variant, the insertion into the skullbase is not uncommon. Therefore, careful evaluation of CT scan of PNS preoperatively is a must to minimize the complications during endoscopic sinus surgery.

Pneumatization of the uncinat process is a very rare entity, but when present, it may cause obstruction to the sinus ostia if associated with the mucosal thickening.

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